

REMARKS/ARGUMENTS

Claims 1-4, 6-7, and 9-16 are pending. Claims 5, 8, and 17-22 have been canceled without prejudice and without disclaimer. Claims 1, 6, 7, and 9 have been amended. No new matter has been introduced. Applicant believes the claims comply with 35 U.S.C. § 112.

Claims 1-4, 7, and 9-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Codilian et al. (US 6,462,896) in view of Gerhart (US 2002/0138692). The Examiner recognizes that Codilian et al. does not disclose counters regarding write operations on first-parity-numbered tracks and second-parity-numbered tracks; and determining, based at least in part on values of counters in the first and second sets, whether a criterion is met; only if the criterion is met, reading data from a second-parity-numbered track; and updating a counter in the first set in a manner that in at least some instances depends on whether the criterion is met. The Examiner cites Gerhart for allegedly providing the missing teaching.

Claims 5, 6, and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Codilian et al. in view of Gerhart and Shirakawa (JP 405334015A). The Examiner cites Shirakawa for allegedly disclosing the additional features recited in dependent claims 5, 6, and 8.

Claim 1 has been amended to incorporate the features of previous claim 5. Claim 7 has been amended to incorporate previous claim 8. Similar features are added to amended claim 9. Thus, the rejection of claims 5 and 8 applies to amended independent claims 1, 7, and 9, and dependent claims 2-4, 6, and 10.

All the independent claims have the feature reflecting "a concept of refreshing data" in the form of "writing the data read from one or more second-parity-numbered tracks to one or more second-parity-numbered tracks" in claims 1, 7, and 9, or "the read-out data is rewritten to the adjacent (odd numbered/even numbered) tracks" in claims 11, 12, and 13.

The claimed invention provides techniques not only to prevent data loss in one track due to a leakage magnetic field, but also to monitor circumstances where the data could become degraded, and regenerate the data before irreparable data loss occurs, and

specifically, when the number of data writes on a magnetic disk surface reaches a predetermined number, the data is "refreshed" by "reading the data on the adjacent track once and, then rewriting the data on the same track" (see present application at paragraph [0041]). Because the adjacent tracks are exposed to the leakage magnetic field multiple times, the data on the adjacent tracks may be deleted little by little and eventually become unreadable. Therefore, data refreshing is necessary in addition to preventing data loss due to leakage magnetic field (see present application at paragraphs [0011] and [0041]).

As discussed below, the cited references fail to teach or suggest the data refreshing aspect of the claimed invention.

Claims 1-4 and 6

Applicant respectfully submits that claim 1 is patentable over Codilian et al., Gerhart, and Shirakawa because, for instance, they do not teach or suggest maintaining a first set of one or more first-parity-track counters and a second set of second-parity-track counters regarding write operations on first-parity-numbered tracks and second-parity-numbered tracks; and in response to a command to write data to a given first-parity-numbered track, determining, based at least in part on values of counters in the first and second sets, whether a criterion is met; only if the criterion is met, reading data from a second-parity-numbered track; and updating a counter in the first set in a manner that in at least some instances depends on whether the criterion is met. The references further fail to teach or suggest if data is read from a second-parity-numbered track, determining a number of retries necessary for reading the data; and if the number of retries reaches a threshold, writing the data read from one or more second-parity-numbered tracks to one or more second-parity-numbered tracks.

The present invention provides a technique that not only prevents data loss but refreshes data including a process of reading the data on the adjacent track. See, e.g., paragraph [0041] ("in some embodiments, when the number of data writes on a magnetic disk surface reaches a predetermined number, on the assumption that it may be possible that data on a track adjacent to the track in question is about to be deleted, the data is refreshed"). Specifically, by maintaining a first set of a first-parity-counters and a second set of a second-parity-counters regarding write operations and by determining whether the criterion is met

based on that, the time required to refresh data can be reduced as it is needed only to refresh the data on the adjacent track when the number of writes on either of the counters reaches a predetermined number (see, e.g., paragraphs [0043]-[0045]). Neither Codilian et al. nor Gerhart discloses the technique for both preventing data loss and refreshing the data at the same time.

Codilian et al. merely discloses a method of providing a plurality of adjacent concentric data tracks interleaved with each other for reducing data loss due to a shock event (see col. 3, lines 5-27). Without disclosing a concept of refreshing a data, a person of ordinary skill in the art would not have been motivated to maintain the set of write counters for a couple of parity numbered tracks as claimed.

Gerhart discloses a method of adjusting a pad parameter based on the number of write counter (see, e.g., paragraph [0046]). There is, however, no disclosure of providing a first parity track and a second parity track, and write counters for the tracks. The Examiner states that adding the counters is used for preventing data error and operating a hard disk logging the track usage in a simple and straight-forward manner. Without the objective or preventing data loss and refreshing the data disclosed, however, there is no motivation or need to provide a first parity track and a second parity track, and to maintain the set of counters for the tracks on the part of Gerhart.

Shirakawa does not cure the deficiencies of Codilian et al. and Gerhart in that it also fails to teach or suggest maintaining a first set of one or more first-parity-track counters and a second set of second-parity-track counters regarding write operations on first-parity-numbered tracks and second-parity-numbered tracks; and in response to a command to write data to a given first-parity-numbered track, determining, based at least in part on values of counters in the first and second sets, whether a criterion is met; only if the criterion is met, reading data from a second-parity-numbered track; and updating a counter in the first set in a manner that in at least some instances depends on whether the criterion is met.

Moreover, the references fail to disclose or suggest if data is read from a second-parity-numbered track, determining a number of retries necessary for reading the

data; and if the number of retries reaches a threshold, writing the data read from one or more second-parity-numbered tracks to one or more second-parity-numbered tracks.

The Examiner alleges that this feature is taught in Shirakawa. Shirakawa discloses that "an error checking frequency means checks the number of times of error, and a warning message display request is sent when the number of times of error exceeds the prescribed error rate of the magnetic disc device." Even though Shirakawa's system is dealing with errors and retry count may provide useful information to the system, Shirakawa only discloses the purpose of preventing a data loss, and does not disclose the purpose of refreshing data in the case an error occurred. Without recognition of the purpose of data refreshing, there is no need on the side of Shirakawa to "write the data read from one or more second-parity-numbered tracks to one or more second-parity-numbered tracks," as recited in claim 1. Therefore, Shirakawa does not disclose or suggest if data is read from a second-parity-numbered track, determining a number of retries necessary for reading the data; and if the number of retries reaches a threshold, writing the data read from one or more second-parity-numbered tracks to one or more second-parity-numbered tracks.

For at least the foregoing reasons, claim 1, and claims 2-4, and 6 depending therefrom, are patentable over Codilian et al., Gerhart, and Shirakawa.

Claim 7

Applicant respectfully submits that claim 7 is patentable over Codilian et al., Gerhart, and Shirakawa because, for instance, they do not teach or suggest storing tracking information regarding writes to first-parity-numbered tracks and second-parity-numbered tracks; in response to a command to write data to a given first-parity-numbered track, determining whether a criterion specifying risk to data on a second-parity-numbered track is met; and if the criterion is met, reading data from one or more second-parity-numbered tracks, and storing the data, so read. The references further fail to teach or suggest determining a number of retries required for reading the data from second-parity-numbered tracks; and if the number of retries reaches a threshold, writing the stored data read from the second-parity-numbered tracks to the second-parity-numbered tracks.

As discussed above, nothing in the references discloses the objective of preventing data loss and refreshing the data at the same time. As a result, a person of ordinary skill in the art would not have been motivated to combine the write counters of Gerhart with the interleaved disk tracks of Codilian et al. to arrive at the claimed invention. More specifically, the references do not suggest storing track information regarding writes to a first parity track and a second parity track, and then using the information to determine whether a criterion is met. Shirakawa merely discloses checking the number of times of error, and sending a warning message display request when the number of times of error exceeds the prescribed error rate of the magnetic disc device, for the purpose of preventing a data loss. Without recognition of the purpose of data refreshing, there is no motivation for Shirakawa to "write the data read from one or more second-parity-numbered tracks to one or more second-parity-numbered tracks," as recited in claim 7.

For at least the foregoing reasons, claim 7 is patentable over Codilian et al., Gerhart, and Shirakawa.

Claims 9 and 10

Applicant respectfully submits that claim 9 is patentable over Codilian et al., Gerhart, and Shirakawa because, for instance, they do not teach or suggest a first set of one or more first-parity-track counters; a second set of one or more second-parity-track counters; and control circuitry that accesses and updates the first and second sets of counters, the control circuitry being configured to respond to a command to write data to a given first-parity-numbered track by determining, based at least in part on values of counters in the first and second sets, whether a criterion is met; only if the criterion is met, reading data from a second-parity-numbered track; and updating a counter in said first set in a manner that in at least some instances depends on whether the criterion is met. The references further fail to teach or suggest if data is read from a second-parity-numbered track, determining a number of retries necessary for reading the data; and if the number of retries reaches a threshold, writing the data read from one or more second-parity-numbered tracks to one or more second-parity-numbered tracks.

As discussed above, nothing in the references discloses the objective of preventing data loss and refreshing the data at the same time. As a result, a person of ordinary skill in the art would not have been motivated to combine the write counters of Gerhart with the interleaved disk tracks of Codilian et al. to arrive at the claimed invention. More specifically, the references do not suggest providing write counters for a first parity track and a second parity track, and then using the information to determine whether a criterion is met. Shirakawa merely discloses checking the number of times of error, and sending a warning message display request when the number of times of error exceeds the prescribed error rate of the magnetic disc device, for the purpose of preventing a data loss. Without recognition of the purpose of data refreshing, there is no motivation for Shirakawa to "write the data read from one or more second-parity-numbered tracks to one or more second-parity-numbered tracks," as recited in claim 9.

For at least the foregoing reasons, claim 9 and claim 10 depending therefrom are patentable over Codilian et al., Gerhart, and Shirakawa.

Claims 11-16

As mentioned above, the cited references fail to teach or suggest the data refreshing aspect of the claimed invention. Independent claims 11, 12, and 13 have the feature reflecting "a concept of refreshing data" in the form of "the read-out data is rewritten to the adjacent (odd numbered/even numbered) tracks." The claimed invention provides techniques not only to prevent data loss in one track due to a leakage magnetic field, but also to monitor circumstances where the data could become degraded, and regenerate the data before irreparable data loss occurs, and specifically, when the number of data writes on a magnetic disk surface reaches a predetermined number, the data is "refreshed." Because the adjacent tracks are exposed to the leakage magnetic field multiple times, the data on the adjacent tracks may be deleted little by little and eventually become unreadable. Therefore, data refreshing is necessary in addition to preventing data loss due to leakage magnetic field (see present application at paragraphs [0011] and [0041]).

Applicant respectfully submits that claim 11 is patentable over Codilian et al. and Gerhart because, for instance, they do not teach or suggest that the number of writes of

data on a given track is acquired and it is detected that the number of writes reaches a predetermined number, and based on the detection, data on tracks adjacent to the given track is read out once and, then, the read-out data is rewritten to the adjacent tracks. Applicant respectfully submits that claim 12 is patentable over Codilian et al. and Gerhart because, for instance, they do not teach or suggest that the number of writes of data on even-numbered physical tracks in the divided areas is acquired and it is detected that the number of writes reaches a predetermined number, and that based on the detection, data on odd-numbered physical tracks in the divided areas is read out once and, then, the read-out data is rewritten on the odd-numbered tracks.

Applicant respectfully submits that claim 13 is patentable over Codilian et al. and Gerhart because, for instance, they do not teach or suggest that the number of writes of data on odd-numbered physical tracks in the divided areas is acquired and it is detected that the number of writes reaches a predetermined number, and that based on the detection, data on even-numbered physical tracks in the divided areas is read out once and, then, the read-out data is rewritten on the even-numbered tracks.

Applicant notes that Codilian et al. does not disclose rewriting the read-out data to the adjacent tracks (claim 11), on the odd-numbered tracks based on detection that the number of writes on the even-numbered physical tracks reaches a predetermined number (claim 12), or on the even-numbered tracks based on detection that the number of writes on odd-numbered physical tracks reaches a predetermined number (claim 13). The Examiner cites Codilian et al. at column 3, lines 11-28 for allegedly disclosing these features. That passage merely discusses assigning consecutively numbered logical block addresses, and postponing writing to the second set of data tracks as the host system initially fills the drive in consecutive logical block order. It does not teach or suggest the rewriting feature as claimed. Gerhart does not cure the deficiencies of Codilian et al.

For at least the foregoing reasons, claims 11-16 are patentable over Codilian et al. and Gerhart.

Appl. No.: 10/674,763
Amdt. dated: August 3, 2006
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2186

PATENT

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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